

REMARKS

Before this amendment, claims 1-11 were pending, with claims 1-4 withdrawn from consideration and claims 5-11 rejected on various grounds asserted in a first office action mailed December 17, 2003. In response to the office action, claims 5 and 11 are amended, claim 6 cancelled without prejudice or disclaimer, and new claims 12 to 16 added. After this amendment, claims 1-5 and 7 to 16 are pending, with claims 1-4 withdrawn. Reconsideration and allowance of the claims in view of the amendments and arguments respectfully are requested.

Rejections - 35 U.S.C. 112

On page 2 of the office action, the examiner has rejected claims 5-11 on indefiniteness grounds, from an opinion that "culture medium having particular nutrients is required." However, applicants stress that the advantageous effects described in the specification and claimed arise from two factors, 1) selection of "a novel genus... (having) a number of advantages...." (specification page 4 lines 5-8) and 2) control of oxygen during culturing "a factor influencing the production of pigments is the dissolved oxygen in the culture" (page 7 lines 4-6). In fact, using two representative members of this unusual genus, applicants extensively have studied the effects of dissolved oxygen as well as "subtle differences in the oxygen consumption rate" (page 7 line 8) as well as how to control this variable. The discoveries and the specific effects of oxygen arose from study of the very difficult variability problem seen "from culture to culture" as described on page 4, line 12. Nutrient variability was not the dispositive factor, and in fact, surprisingly, oxygen tension accounted for the strange batch to batch differences (as described, for example, on page 7 line 17 through page 8 line 6 and further detailed in examples 1, 3 and 4 of the specification). Accordingly, the oxygen control discovered and claimed operates over different nutrient conditions. Applicants report a single optimized nutrient condition for convenience, and were not obligated to show how different nutrients fail to provide the differences seen with different oxygen concentrations.

The Examiner argues that "the extent of 'increase' cannot be readily ascertained in the absence of an indication of the baseline production ratio intended" (page 2, middle of the office action). However, the experimental results provided show baselines. The baseline of the concentration of dissolved oxygen for the production ratio of adonixanthin in claim 9 is 5% as can be seen from Tables 3, 4, 5, 7, 8, 9 and 10. The baseline of the concentration of dissolved oxygen for the production ratio of astaxanthin in claim 10 is 5% and 35% as can be seen from Tables 3, 4, 5, 7, 8, 9 and 10. The baseline of the concentration of dissolved oxygen for the production ratio of precursors in claim 11 is 35% as can be seen from Tables 3, 4, 5, 7, 8, 9, and 10. In any one of claims 9 to 11, an increase in the production ratios of the carotenoid compounds was confirmed at a concentration of dissolved oxygen within the claimed range.

Reconsideration and removal of this rejection in view of these facts courteously are solicited.

Near the bottom of page 2 in the office action, the Examiner argues that "Claims 5-11 are incomplete in the absence of a recovery step." In response, applicants add the phrase "and recovering caretenoids from the microorganism," to the claims.

Reconsideration and removal of this rejection in view of the amendment courteously is solicited.

The Examiner argues that the term "the resultant" is unclear. In response, applicants change this term to "produced."

Reconsideration and removal of this rejection in view of the amendment courteously is solicited.

On the bottom of page 2, the Examiner argues that "'the production ratios of are increased' is uncertain since the baseline is not indicated." In response, applicants have deleted the offending language and have stated that the oxygen concentration is limited to no more than 10%.

Removal of this rejection in view of the amendment courteously is solicited.

Enablement Rejection

On page 3 of the office action, the Examiner has rejected claims 5, 6, and 8-11 on alleged enablement grounds but admits enablement "with the strains E-396, FERM BP-4283 and A-581-1, FERM BP-4671, and mutants thereof that produce a plurality of carotenoids."

In response, applicants point out that a discovery, as described in the specification on page 4, lines 5-6 pertains to "[b]acterial strains E-396 (FERM BP-4283) and A-581-1 (FERM BP-4671) belonging to a novel genus." The specification, on the middle of page 5 provides art recognized guidance for determining a member of this genus "classification of microorganisms based on the homology of nucleotide sequences of 16S ribosomal RNAs has become predominant as means for classifying microorganisms" and furthermore, the "reliability of classification is remarkably improved when it is based on the homology of nucleotide sequences of 16S ribosomal RNAs since those nucleotide sequences are hereditarily very stable." Furthermore, applicants have good data from two species within this genus and that differ by 0.6% of their 16S rRNA sequence, within this definition.

Reasonable expectation of success exists for these claims because use of identity of the 16S rRNA sequence is well established and data exists with two species. Bacteria in fact generally are classified into a phylogenic tree this way and a microorganism with a high identity such as 98% identity for 16S rRNA is acknowledged by an academician in this field to denote the same kind of strain. Thus, undue experimentation is not required to practice the invention because the production ratios of the carotenoid compounds can be changed simply by changing the concentration of dissolved oxygen in the culture medium according to the guidance provided in working examples 1 to 4.

In view of the foregoing arguments, reconsideration and allowance earnestly are requested.

On the bottom of page 3 of the office action, the Examiner argues that "cryptoxanthin is never produced" for strains E-396 or A-581-1 and that "while E-396 produces asteroidenoine,

strain A-581-1 does not." However, the claims are not limited to the absolute production or absence of these species and, as described in Tables 3, 7, and 9, various carotenoid compounds other than cryptoxanthin were produced. Claim 5 and the other claims recite control of oxygen for a group of closely related organisms in an unusual discovered group, and are not limited to the particular compounds cited by the Examiner. The Examiner asserts that "the production of carotenoids is strain dependent and unpredictable" but, as discovered, a special group of organisms and a class of compounds with qualitative differences in that class are claimed. Oxygen tension, particularly during logarithmic growth phase, was THE unifying factor that caused the qualitative differences and is claimed.

Reconsideration and allowance in view of the amendments and arguments are requested.

Applicants note that a skilled artisan, armed with modern understanding of genus differences elucidated by 16S rRNA homologies, readily will understand what is meant by the new "genus" of bacteria with the unusual properties that have been exploited in the claimed invention. Accordingly, new claims 13-16 are presented, which do not add new material over the previous claims, but take advantage of the skilled artisan's understanding of "genus" as used in this context and as referred to on page 4 lines 5-6 of the specification.

CONCLUSION

Consideration and allowance of the claims is earnestly solicited. If a telephonic discussion could advance this case, the Examiner is courteously requested to contact the undersigned at 202-912-2195.

Respectfully submitted,

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